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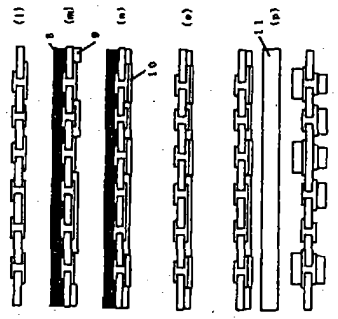
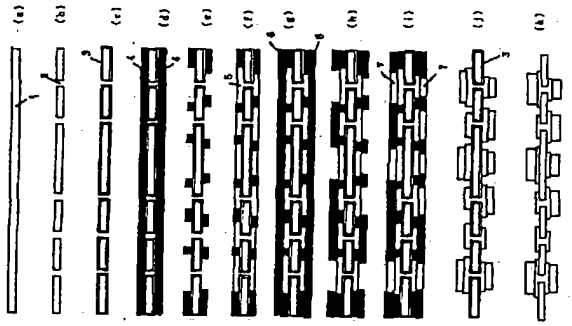
(54)【発明の名称】多層基板およびその製造方法

(57)【要約】

【構成】　本発明は、少なくとも片面に配線パターンが形成された基板を２枚以上張合わせた多層基板であって、張合わせる２枚の基板の張合わせ面の少なくとも一方に電気的接続用に突起を形成し、かつ該突起は張合わせ時に突合されるもう一方の基板上の突起またはパッドとの高さの合計が、該張合わせる２つの基板の張合わせ面に形成された配線パターンの導体の高さの合計よりも大きくなるよう形成した多層基板に関する。

【効果】　本発明によると、多層基板の基板間の接続にスルーホールを使用しないので、高密度の配線が可能となる。また基板の配線間の電気的接続を低抵抗で安定して実現することができる。





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【特許請求の範囲】

【請求項１】少なくとも片面に配線パターンが形成された基板を２枚以上張合わせた多層基板であって、張合わせる２枚の基板の張合わせ面の少なくとも一方に突起を形成し、かつ該突起は張合わせ時に突合されるもう一方の基板上の突起またはパッドとの高さの合計が、該張合わせる２つの基板の張合わせ面に形成された配線パターンの導体の高さの合計よりも大きくなるよう形成し、張合わせる２枚の基板の配線間の導通を該突起位置でとったことを特徴とする多層基板。

【請求項２】該張合わせる２枚の基板の間に、異方導電性フィルムまたは異方導電性樹脂を挟んだことを特徴とする請求項１記載の多層基板。

【請求項３】張合わせる２枚の基板の張合わせ面の少なくとも一方に突起を形成し、かつ該突起は張合わせ時に突合されるもう一方の基板上の突起またはパッドとの高さの合計が、該張合わせる２つの基板の張合わせ面に形成された配線パターンの導体の高さの合計よりも５μｍから５０μｍの範囲で大きくなるよう形成したことを特徴とする請求項１記載の多層基板。

【請求項４】２枚の張合わせられる基板の張合わせ面の少なくとも一方の面に、突き合わせられる突起もしくはパッド部分を除いて絶縁層が形成されてなることを特徴とする請求項１記載の多層基板。

【請求項５】張合わせる２枚の基板の張合わせ面の少なくとも一方に突起を形成し、かつ該突起は張合わせ時に突合されるもう一方の基板上の突起またはパッドとの高さの合計が、該張合わせる２つの基板の張合わせ面に形成された配線パターンの導体の高さおよび絶縁層高さの合計よりも５μｍから５０μｍの範囲で大きくなるよう形成したことを特徴とする請求項４記載の多層基板。

【請求項６】張合せる２枚の基板の張合せ面の少なくとも一方に張合せ位置決めのための画像処理用マークを形成したことを特徴とする請求項１記載の多層基板。

【請求項７】基板がプラスチックフィルムであることを特徴とする請求項１記載の多層基板。

【請求項８】少なくとも片面に配線パターンが形成された基板を２枚以上張合わせた多層基板において、張合わせる２枚の基板の張合わせ面の少なくとも一方に突起を形成した多層基板の製造方法であって、基板上にフォトレジストを用いたアディティブ法で配線パターンを形成し、引き続き配線パターンの一部にめっきにより突起を形成する際に、配線パターン形成に使用した該フォトレジストを剥離せずに、新たにフォトレジストを積層し、突起形成後に２枚のフォトレジストを同時に剥離することをを特徴とする多層基板の製造方法。

【発明の詳細な説明】

【０００１】

【産業上の利用分野】本発明は、電子部品を搭載する電気回路配線基板およびその製造方法に関する。さらに詳しくは、柔軟性、極薄型、高密度配線を特徴とする電気回路配線基板およびその製造方法に関する。

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【０００２】

【従来の技術】多層基板は電子部品の高密度実装基板として、電子機器の小型軽量化に貢献している。中でもフレキシブル多層基板は、柔軟性、極薄型を特徴とし、ＩＣや抵抗などの電子部品を搭載する回路基板や主としてＩＣを搭載するマルチチップモジュール、チップサイズパッケージに利用される。

【０００３】多層基板を構成する基板の片面または両面に導体による配線パターンが形成される。異なる基板間の配線パターン間は、多層基板の厚さ方向に貫通した貫通スルーホールと呼ばれる経路で接続される。基板の両面に配線パターンが構成される場合、基板両面の配線パターンの間は貫通スルーホールの他に、ブラインドビアホールやインナビアホールと呼ばれる１枚の基板を貫通する経路で接続される。貫通スルーホールは、多層基板の全層を貫通するため、該スルーホールによる接続が不要な層においても所定の面積を占有してしまい、配線の高密度化を阻害している。また、貫通スルーホールは多層基板を積層してしまってから、孔明けして形成するため、各基板の積層誤差が積算された状態で孔明け位置決めすることになり、このことも配線の高密度化を阻害している。さらに積層した後では、貫通スルーホールの長さ／直径で表わされるアスペクト比が大きくなって、レーザーや化学エッチングによる孔明け加工が困難になるため、ドリルを使った機械加工に頼らざるをえず、直径０．２mm以下といった微細な孔明けが難しい。

【０００４】多層基板を構成する各基板上の配線間の接続をおこなうために、接続させたくない部分を絶縁膜で覆った後、異方導電性フィルムを挟み、加熱圧着する方法が公開特許公報昭和６１－２７８１９６号、平５－２１９６０号で提案されている。異方導電性フィルムは、エポキシなどの樹脂に、金属粒子または金属被覆した樹脂粒子を分散させたものである。

【０００５】インナビアホールを形成した両面配線基板をこのような方法で積層する例を図２に示す。１２、１５はインナビアホールを形成した両面配線基板、１３は絶縁膜、１４は異方導電性フィルムである。

【０００６】この方法では、配線密度が比較的低い場合は十分な接続抵抗や接続信頼性が得られるが、配線密度が高くなり、例えば接続させたい電極寸法が直径５００μｍ以下になってくると接続抵抗や接続信頼性において不十分であることが本発明者らの検討によって明らかになった。すなわち、接続させたい電極は、接続させない回路部分と同時に作製され同じ高さであるため、図２に示されるように絶縁層に対して凹んでいる。ここに異方導電性フィルムや異方導電性樹脂を挟んで圧着した場合、異方導電性フィルムや異方導電性樹脂に分散させられた導電性の粒子が異方導電性フィルムや異方導電性樹

脂の厚さ方向に複数個連なる必要があり、電極面積が小さくなって導通に寄与する導電性粒子が少なくなってくると、接続抵抗や接続信頼性において問題となる。異方導電性フィルムまた異方導電性樹脂に分散させられた導電性粒子は厚みまたは樹脂の塗布厚みよりも小さいことと樹脂の体積が大きく減じることはないことのため、絶縁層と電極が同じ高さの場合も接続させたい電極が絶縁層に対して凹んでいる場合と同様に、導電性の粒子が異方導電性フィルムや異方導電性樹脂の厚さ方向に複数個連なる必要があり、電極面積が小さくなって導通に寄与する導電性粒子が少なくなってくると、接続抵抗や接続信頼性において問題となる。抵抗値が大きくなると、信号遅延時間が大きくなって高速信号処理回路に使用できなくなったり、ジュール熱のため流せる電流値が制限される問題がある。

【０００７】

【発明が解決しようとする課題】本発明の目的は、高密度配線が可能な多層基板を提供することにある。さらには、柔軟性、極薄型といったフレキシブル基板の特徴を備えたまま高密度配線が可能な多層フレキシブル基板を提供することにある。

【０００８】

【課題を解決するための手段】本発明の目的は以下の構成により達成される。

【０００９】①　少なくとも片面に配線パターンが形成された基板を２枚以上張合わせた多層基板であって、張合わせる２枚の基板の張合わせ面の少なくとも一方に突起を形成し、かつ該突起は張合わせ時に突合されるもう一方の基板上の突起またはパッドとの高さの合計が、該張合わせる２つの基板の張合わせ面に形成された配線パターンの導体の高さの合計よりも大きくなるよう形成し、張合わせる２枚の基板の配線間の導通を該突起位置でとったことを特徴とする多層基板

②　少なくとも片面に配線パターンが形成された基板を２枚以上張合わせた多層基板において、張合わせる２枚の基板の張合わせ面の少なくとも一方に突起を形成した多層基板の製造方法であって、基板上にフォトレジストを用いたアディティブ法で配線パターンを形成し、引き続き配線パターンの一部にめっきにより突起を形成する際に、配線パターン形成に使用した該フォトレジストを剥離せずに、新たにフォトレジストを積層し、突起形成後に２枚のフォトレジストを同時に剥離することをを特徴とする多層基板の製造方法。

【００１０】本発明の基板とは、通常のプリント配線板に使われるガラスーエポキシ、ガラスービスマレイミドトリアジン、ガラスーポリイミドなどのリジッド基板が使用できるが、薄手であるため微小孔明けが比較的容易なフレキシブル基板の採用が好ましい。

【００１１】該フレキシブル基板とは、ポリエステルフィルムやポリイミドフィルムなどプラスチックフィルムの片面もしくは両面に、銅などの導電性材料で電気配線パターンを形成したものである。これらのプラスチックフィルムの厚さは１０μｍから２００μｍの範囲から選ばれることが好ましい。

【００１２】該導電性材料はめっき、蒸着などで形成される他に銅箔などの金属箔を接着剤を使って張合わせてもよい。一般的に、めっきや蒸着では配線の厚みは０．２μｍから１０μｍであり、銅箔では９μｍから７０μｍである。厚みは小さい方が微細パターニングに適しており、一方、厚みが大きい方が寸法安定性や耐久性に優れる。電気配線パターンはレジストを使ったパターンエッチング、パターンメッキなどで形成することができる。プラスチックフィルムの上に導電性材料を付加するほかに、銅箔などの金属箔の上にポリイミド樹脂などをコーティングすることによってフレキシブル基板を形成することもできる。

【００１３】本発明の突起は、レジストを使ったパターンメッキによって形成する方法やスタッドバンプと呼ばれるワイヤボンダを利用して形成する方法がある。あるいは、厚い金属箔から複数回のパターンエッチングにより配線部分と突起部分を作り分ける方法、はんだを盛る方法や導電性樹脂のパターン印刷をする方法も可能である。突起の材質は特に限定されないが、抵抗を小さくするために金、銀、銅の採用が好ましく、耐蝕性が良好な点で金、ニッケル、はんだの採用が好ましい。また銅の突起の上に金やニッケルを薄く被覆させることも好ましい構成である。

【００１４】多層基板とは該基板を２枚以上積層したものをいう。異なる基板上の配線間の電気接続をとる点において、従来のようにスルーホールを採用せず、張合わせる２枚の基板の張合わせ面の少なくとも一方に突起を形成し、該突起を経由して張合わせる２枚の基板の上の配線間の電気接続をとることが高密度配線のために重要である。２枚の基板の張合わせ面の両方に突起を形成するか、片方に突起を形成してかつ対向する側に配線パターンの導体の高さと同等かそれ以下の高さのパッドを形成し、突起どうしまたは突起とパッドの間で異方導電性フィルム、異方導電性樹脂、導電性樹脂を介して電気接続をとる。

【００１５】基板の両面に形成した配線間を接続することは、１枚の基板に孔を明け、孔内をめっきなどで導通化することで実現することができる。

【００１６】異方導電性フィルムとは、エポキシなどの熱硬化性樹脂または熱硬化性樹脂と熱可塑性樹脂の混合樹脂に直径３μｍから２０μｍの金属粒子、樹脂被服金属粒子、金属被覆樹脂粒子や金属被覆樹脂粒子をさらに樹脂で被覆したものを分散させ厚さ１０μｍから５０μｍの乾燥したフィルム状にしたものを言う。厚さ方向に加熱圧着することで、樹脂を硬化させて２枚の基板を接着し、かつ適度な密度で分散させられた導電性粒子で厚

さ方向のみに導通を図ることができる。異方導電性樹脂とは同様の導電性粒子を溶媒を含んだ樹脂に分散させたペースト状のものを言う。導電性樹脂とは、導電性粒子が異方導電性樹脂よりも高密度で含まれるため、導通の異方性をもたないものである。導電性樹脂は導通方向に異方性をもたないため、２枚の基板上の配線間の電気接続をとるときは、接続させたい部分だけに樹脂を塗布することが好ましい。配線パターンに絶縁層を積層する場合は、必ずしも接続させたい部分だけに樹脂を塗布する必要はない。狭ピッチの接続パターンに対応しやすい点で異方導電性樹脂の採用が好ましい。

【００１７】本発明において、張合わせ時に突合されるもう一方の基板上の突起またはパッドとの高さの合計が、該張合わせる２つの基板の張合わせ面に形成された配線パターンの導体の高さの合計よりも大きくなるよう形成することが重要である。張合わせ時に突合されるもう一方の基板上の突起またはパッドとの高さの合計が、該張合わせる２つの基板の張合わせ面に形成された配線パターンの導体の高さの合計よりも５μｍから５０μｍの範囲で大きくなるように形成することが好ましい。より好ましくは８μｍから３５μｍ、さらに好ましくは１０μｍから２５μｍである。張合わせ時に突合されるもう一方の基板上の突起またはパッドとの高さの合計が、該張合わせる２つの基板の張合わせ面に形成された配線パターンの導体の高さの合計よりも５μｍ未満で高い場合は、電気的接続位置において、異方導電性フィルムや異方導電性樹脂中の導電性粒子の凝集が十分起こらず、良好な低抵抗や高い信頼性を得にくい。張合わせ時に突合されるもう一方の基板上の突起またはパッドとの高さの合計が、該張合わせる２つの基板の張合わせ面に形成された配線パターンの導体の高さの合計よりも５０μｍよりも大きい場合は、張合わせる基板間の距離が離れ、基板間を充填する異方導電性フィルムや異方導電性樹脂つまり導電性粒子を含む樹脂を厚くする必要があり、基板間の接着力が小さくなったり、厚い異方導電性フィルムや異方導電性樹脂を突起部分で圧縮する過程で突起先端での導電性粒子の凝集が十分起こらず、良好な低抵抗や高い信頼性を得にくいほか、高い突起形成にコストがかかる問題がある。張合わせ面の少なくとも片面に絶縁層が形成される場合は、配線パターンの導体高さに代えて、配線パターンの導体高さにこれを被覆する絶縁層の高さを加えて、同様に考えることができる。

【００１８】本発明の絶縁層は、ポリイミド、ポリアミド、アクリル、エポキシなどの樹脂からなる。該絶縁層は２枚の張り合わせられる基板の張り合わせ面の少なくとも一方の面に、突き合わせられる突起もしくはパッド部分は除いて形成される。突き合わせられる突起もしくはパッド部分を除いて絶縁層を形成する方法としては、スクリーン印刷などの印刷法、全面に塗布された絶縁層をレジストを用いてパターンエッチングする方法や感光性絶縁材を用いてパターンエッチングする方法がある。

【００１９】本発明の多層基板の製造方法の一例について図１を用いて説明するが、これに限定されるものではない。

【００２０】所定の厚さのポリイミドフィルム１を用意し（ａ）、レーザーにて所定の直径の孔２を所定位置に明ける（ｂ）。孔明けしたフィルムに無電解めっき法にて厚さ０．２μｍの銅膜３を形成する（ｃ）。無電解めっきで孔の内部にも銅膜が形成される。ドライフィルムフォトレジスト４を該フィルム両面に張り付け（ｄ）、露光、現像してドライフィルムフォトレジスト４を配線、突起およびパッドに対応した形状にパターニングする（ｅ）。ついで電解めっき法にて厚さ１０μｍの銅膜５を形成する（ｆ）。銅膜はドライフィルムフォトレジストが除去され無電解めっきで形成された銅膜が露出した部分だけに析出する。さらにドライフィルムフォトレジスト６を両面に張り付け（ｇ）、露光、現像して、ドライフィルムフォトレジストを突起に対応した形状にパターニングする（ｈ）。再び電解めっき法にて厚さ１５μｍの膜７を積層し（ｉ）、配線部厚みよりも１５μｍ高い突起を形成する。ドライフィルムフォトレジスト４、６を剥離し（ｊ）、ついで無電解めっき膜３をフラッシュエッチングして除去する（ｋ）。

【００２１】図１（ａ）～（ｆ）の工程の後、ドライフィルムフォトレジストを除去して、ついで無電解めっき膜をフラッシュエッチング除去して（ｌ）のフレキシブル基板を得る。基板を洗浄、乾燥した後、一方の面に保護フィルム８を張り付け、もう一方の面に感光性ポリイミドを塗布し、乾燥、露光、現像、熱処理してパッド部分が除去された厚さ５μｍの絶縁膜パターン９を形成する（ｍ）。ついで無電解めっき法にて厚さ６μｍの銅膜１０を形成する（ｎ）。銅膜は絶縁膜が除去され無電解めっきで形成された銅膜が露出した部分だけに析出する。保護フィルム８を剥離する（ｏ）。

【００２２】かくして図１（ｋ）（ｏ）に示した２枚のフレキシブル基板が得られる。一方のフレキシブル基板に異方導電性フィルム１１を重ね、８０℃のボンディングツールで仮圧着し、ついで異方導電性フィルムの保護フィルムを剥離する。２枚のフレキシブル基板の対応する突起とパッドを位置合わせし、２９０℃のボンディングツールで本圧着し、４層の配線を持つ多層フレキシブル基板を得る。

【００２３】従来は、図１（ｆ）の後、一度ドライフィルムフォトレジストを剥離し、改めてドライフィルムフォトレジストを張付けていたが、本発明では途中の剥離工程を省略したため、段差が少ない状態で次のドライフィルムフォトレジストを張付けることができる。段差が大きいと段差の部分でレジストと基板間に空隙が発生し、レジストのはがれやめっき液の染み込みで余計な部分にめっき膜が生成したりする問題がおこりやすい。

【００２４】また、剥離工程、しいては洗浄工程を省略できコストダウンが図れる。

【００２５】上述の例では、ドライフィルムフォトレジストを使用したが、液状フォトレジストや電着レジストも同様に使用することができる。

【００２６】本発明にかかる多層基板は、高密度電子回路配線板やそれを応用したマルチチップモジュール、シングルチップモジュール、チップサイズパッケージ、ボールグリッドアレイパッケージなどに用いられる。

【００２７】

【実施例】

実施例１

図１に示した工程で多層基板を作製した。厚さ２５μｍのポリイミドフィルム１（“カプトン”Ｅ、東レ・デュポン（株））に、ＹＡＧの第４高調波レーザーを使い焦点法にて直径２０μｍの孔２を所定位置に明けた。孔明けした該フィルムを洗浄し、無電解めっき法にて厚さ０．２μｍの銅膜３を形成した。厚さ１０μｍのドライフィルムフォトレジスト４（“ダイヤロン”ＦＲＡ－０７５、三菱レイヨン（株））を該フィルム両面に張り付け、フォトマスク露光、現像してドライフィルムフォトレジストを配線、突起およびパッドに対応した形状にパターニングした。ついで電解めっき法にて厚さ１０μｍの銅膜５を形成した。さらに厚さ１５μｍのドライフィルムフォトレジスト６（“ダイヤロン”ＦＲＡ－０７５、三菱レイヨン（株））を両面に張り付け、フォトマスク露光、現像して、ドライフィルムフォトレジストを突起に対応した形状にパターニングした。再び電解めっき法にて厚さ１５μｍの銅膜７を積層し、配線部厚みよりも１５μｍ高い突起を形成した。突起の直径は１００μｍとした。ドライフィルムフォトレジスト４、６を剥離し、ついで無電解めっき膜３をフラッシュエッチングして除去した。かくして図１（ｋ）のフレキシブル基板を得た。

【００２８】図１（ａ）～（ｆ）の工程の後、ドライフィルムフォトレジストを除去して、ついで無電解めっき膜をフラッシュエッチング除去して（ｌ）のフレキシブル基板を得た。基板を洗浄、乾燥した後、一方の面に厚さ２５μｍの保護フィルム８を張り付け、もう一方の面に感光性ポリイミド９（“フォトニース”ＵＲ３１００、東レ（株））を塗布し、乾燥、フォトマスク露光、現像、熱処理してパッド部分が除去された厚さ５μｍの絶縁膜パターンを形成した。ついで無電解めっき法にて厚さ６μｍの銅膜１０を形成した。保護フィルム８を剥離した。かくして図１（ｏ）のフレキシブル基板を得た。

【００２９】図１（ｏ）のフレキシブル基板に厚さ１６μｍの異方導電性フィルム１１（“アニソルム”ＡＣ－７２０１、日立化成工業（株））を重ね、異方導電性フィルム側から８０℃のボンディングツールで１０秒仮圧着し、ついでフレキシブル基板との仮圧着とは反対面にある異方導電性フィルムの保護フィルムを剥離した。２枚のフレキシブル基板の対応する突起とパッドを位置合わせし、図１（ｏ）の基板側から２８０℃のボンディングツールで６０秒本圧着し、４層の配線を持つ多層フレキシブル基板を得た。

【００３０】かくして得た多層フレキシブル基板の基板間接続部の抵抗を測定したところ、接続部（突起）あたり７ｍΩから１５ｍΩの抵抗が測定され良好であった。

【００３１】実施例２

絶縁膜９を形成しないことと図１（ｎ）のパッド上へのめっき上積み１０を行わないこと以外は実施例１と同様にして４層の配線層を持つ多層フレキシブル基板を得た。

【００３２】かくして得た多層フレキシブル基板の基板間接続部の抵抗を測定したところ、接続部（突起）あたり９ｍΩから１３ｍΩの抵抗が測定され良好であったが、基板張合わせ時の位置ずれや基板の変形によって基板間接続部とこれに隣接する配線パターンとの間で電流のリークが観察されることがあった。

【００３３】実施例３

耐熱性エポキシ系接着剤に、直径５μｍのポリスチレン粒子に金めっきした導電性粒子（積水ファインケミカル（株））を1×10^{8}個／cm^{3}の密度で分散させて異方導電性樹脂を得た。異方導電性フィルムの代わりに該異方導電性樹脂を図１（ｏ）のフレキシブル基板に厚さ１５μｍになるようスピンコートしたことと、該異方導電性樹脂が塗布されたフレキシブル基板と図１（ｋ）のフレキシブル基板の対応する突起とパッドを位置合わせし、図１（ｏ）の基板側から２８０℃のボンディングツールで６０秒圧着したこと以外は実施例１と同様にして、４層の配線を持つ多層フレキシブル基板を得た。

【００３４】かくして得た多層フレキシブル基板の基板間接続部の抵抗を測定したところ、接続部（突起）あたり１３ｍΩから２４ｍΩの抵抗が測定され良好であった。

【００３５】実施例４

図１（ｉ）での銅めっきを厚さ３μｍにしたこと以外は、実施例１と同様にして４層の配線を持つ多層フレキシブル基板を得た。かくして得た多層フレキシブル基板の基板間接続部の抵抗を測定したところ、接続部（突起）あたり８０ｍΩから２００ｍΩの抵抗値が測定され、実施例１に比べると抵抗値が大きかったが、比較例１に比べると抵抗値は小さかった。

【００３６】実施例５

図１（ｉ）での銅めっきを厚さ１００μｍにしたことと異方導電性樹脂の厚みを８０μｍにしたこと以外は、実施例３と同様にして４層の配線を持つ多層フレキシブル基板を得た。かくして得た多層フレキシブル基板の基板間接続部の抵抗を測定したところ、接続部（突起）あた

り４０mΩから１００mΩの抵抗値が測定され、実施例１に比べると抵抗値が大きかったが、比較例１に比べると抵抗値は小さかった。

【００３７】比較例１

図１（ａ）～（ｆ）の工程の後、ドライフィルムフォトレジストを除去して、ついで無電解めっき膜をフラッシュエッチング除去して図２の１２のフレキシブル基板を得た。図２のように、基板を洗浄、乾燥した後、張合わせ面側に感光性ポリイミド１３（“フォトニース”ＵＲ３１００、東レ（株））を塗布し、乾燥、フォトマスク露光、現像、熱処理してパッド部分が除去された厚さ５μmの絶縁膜パターンを形成した。

【００３８】該フレキシブル基板に厚さ１６μmの異方導電性フィルム１４（“アニソルム”ＡＣ－７２０１、日立化成工業（株））を重ね、異方導電性フィルム側から８０℃のボンデディングツールで１０秒仮圧着し、ついでフレキシブル基板との仮圧着とは反対面にある異方導電性フィルムの保護フィルムを剥離した。

【００３９】図１（ａ）～（ｆ）の工程の後、ドライフィルムフォトレジストを除去して、ついで無電解めっき膜をフラッシュエッチング除去して図２の１５の配線パターンが異なるフレキシブル基板を得た。

【００４０】２枚のフレキシブル基板の対応する突起とパッドを位置合わせし、図２の１５の基板側から２８０℃のボンデディングツールで６０秒本圧着し、４層の配線を持つ多層フレキシブル基板を得た。

【００４１】かくして得た多層フレキシブル基板の基板

間接続部の抵抗を測定したところ、接続部（突起）あたり３００mΩから１kΩのばらつきが大きく、値も大きな抵抗が測定され不良であった。

【００４２】

【発明の効果】本発明は、配線パターンが形成された基板を２枚以上張合わせた多層基板であって、張合わせる２枚の基板の張合わせ面の少なくとも一方に２枚の基板の電気的接続用の突起を形成し、かつ該突起は張合わせ時に突合されるもう一方の基板上の突起またはパッドとの高さの合計が、該張合わせる２つの基板の張合わせ面に形成された配線パターンの導体の高さの合計よりも大きくなるよう形成されてなるので、張合わせる２枚の基板の配線間の電気的接続を低抵抗で安定して実現することができる。また基板間の接続にスルーホールを使用しないので、高密度の配線が可能となる。

【図面の簡単な説明】

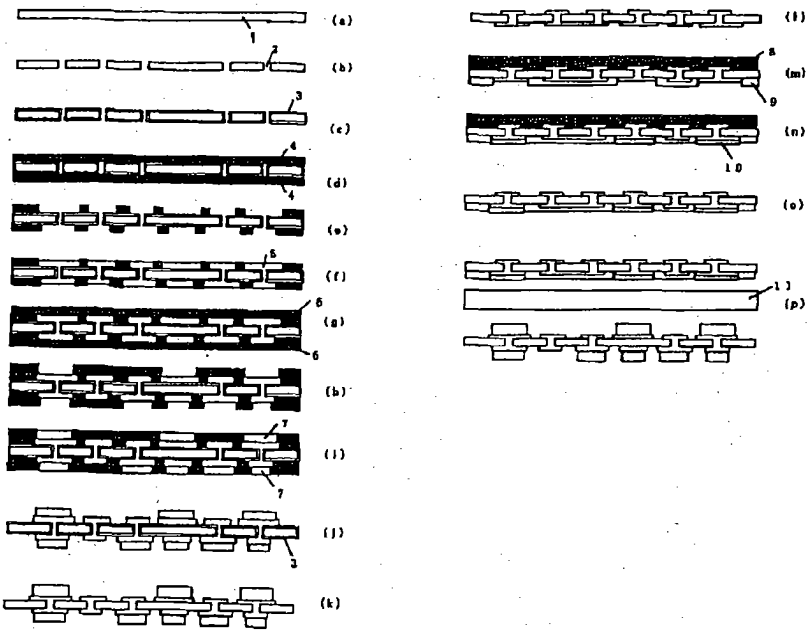
【図１】本発明の実施例の多層基板の工程および構造を示す断面図。

【図２】従来の多層基板の構造を示す断面図。

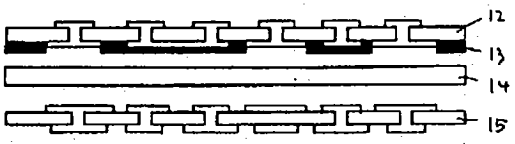
【符号の説明】

１：プラスチックフィルム
３：無電解めっき膜
４、６：フォトレジスト
５、７：電解めっき膜
８：保護フィルム
９、１３：絶縁層
１１、１４：異方導電性フィルム

【図１】



【図２】



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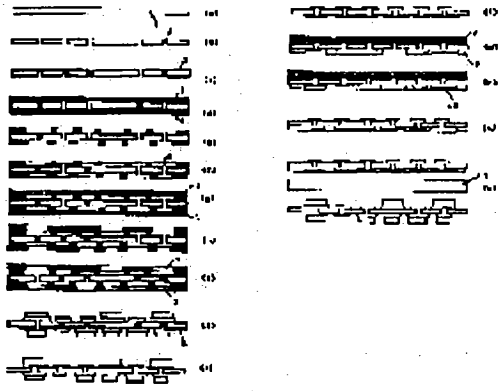
(72)Inventor : AKAMATSU TAKAYOSHI
INOUE YOSHINORI
ENOMOTO YUTAKA

(54) MULTILAYER BOARD AND MANUFACTURE THEREOF

(57)Abstract:
PURPOSE: To make a high-density wiring possible by a method wherein two sheets of flexible substrates are formed in such a way that the total of the heights of projections or pads on the substrate on one side of the substrates, which, are butted to each other at the time of a laminating of the substrates, is longer than the total of the heights of wiring patterned conductors formed on the laminated surfaces of the two substrates.
CONSTITUTION: Two sheets of flexible substrates are formed in such a way that the total of the heights of projections or pads on the substrate on one side of the substrates, which are butted to each other at the time of a laminating of the substrates, is longer than the total of the heights of wiring patterned conductors formed on the laminated surfaces of the two substrates which are laminated together. The two sheets of the obtained flexible substrates are shown in diagrams (k) and (0). An anisotropic conductive film 11 is superposed on the flexible substrate on one side of these flexible substrates, the film 11 is temporarily pressure bonded to the substrate by a bonding tool, then, a protective film on the film 11 is peeled off. The projections or the pads, which correspond to each other, of the two sheets of the flexible substrates are aligned with each other and the film 11 is finally pressure bonded to the flexible substrate on one side by the bonding tool to obtain a multilayer flexible board having four layers of wirings.



LEGAL STATUS

[Date of request for examination]

[Date of sending the examiner's decision of rejection]

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[Patent number]

[Date of registration]

[Number of appeal against examiner's decision of rejection]

[Date of requesting appeal against examiner's decision of rejection]

[Date of extinction of right]

* NOTICES *

1. This document has been translated by computer.So the translation may not reflect the original precisely.
2. **** shows the word which can not be translated.
3.In the drawings, any words are not translated.

CLAIMS

[Claim(s)]
[Claim 1] It is the multilayer substrate which made two or more substrates by which the circuit pattern was formed at least in one side rival. A salient is formed at least in one side of the cladding side of two substrates made to rival. And the salient on another [with which this salient is compared at the time of cladding] substrate or the sum total of height with a pad The multilayer substrate characterized by taking the flow during wiring of two substrates which form so that it may become larger than the sum total of the height of the conductor of the circuit pattern formed in the cladding side of the substrate of these two **********, and are made to rival in this salient position.
[Claim 2] The multilayer substrate according to claim 1 characterized by inserting a different direction conductivity film or different direction conductive resin between the substrates of these two **********.
[Claim 3] A salient is formed at least in one side of the cladding side of two substrates made to rival. And the salient on another [with which this salient is compared at the time of cladding] substrate or the sum total of height with a pad The multilayer substrate according to claim 1 characterized by forming so that it may become large in 5 to 50 micrometers rather than the sum total of the height of the conductor of the circuit pattern formed in the cladding side of the substrate of these two **********.
[Claim 4] The multilayer substrate according to claim 1 which an insulating layer is formed in one [at least] field of the cladding side of two substrates made to rival except for the salient or pad portion compared, and is characterized by the bird clapper.
[Claim 5] A salient is formed at least in one side of the cladding side of two substrates made to rival. And the salient on another [with which this salient is compared at the time of cladding] substrate or the sum total of height with a pad The multilayer substrate according to claim 4 characterized by forming so that it may become large in 5 to 50 micrometers rather than the sum total of the height of the conductor of the circuit pattern formed in the cladding side of the substrate of these two **********, and insulating-layer height.
[Claim 6] The multilayer substrate according to claim 1 characterized by forming the mark for image processings for cladding positioning at least in one side of the cladding side of the substrate of two ********.
[Claim 7] The multilayer substrate according to claim 1 characterized by a substrate being plastic film.
[Claim 8] In the multilayer substrate which made two or more substrates by which the circuit pattern was formed at least in one side rival It is the manufacture method of the multilayer substrate which formed the salient at least in one side of the cladding side of two substrates made to rival. A circuit pattern is formed on a substrate by the additive process which used the photoresist. The manufacture method of the multilayer substrate which newly carries out the laminating of the photoresist and is characterized by ****** which exfoliates the photoresist of two sheets simultaneously after salient formation, without exfoliating this photoresist used for circuit pattern formation in case a salient is succeedingly formed in a part of circuit pattern with plating.

[Translation done.]

DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Industrial Application] this invention relates to the electrical circuit wiring substrate in which electronic parts are carried, and its manufacture method. It is related with the electrical circuit wiring substrate characterized by flexibility, the ultra-thin type, and high-density wiring, and its manufacture method in more detail.
[0002]
[Description of the Prior Art] The multilayer substrate is contributing to small lightweight-ization of electronic equipment as a high-density-assembly substrate of electronic parts. Especially, a flexible multilayer substrate is characterized by flexibility and the ultra-thin type, and is used for the circuit board which carries electronic parts, such as IC and resistance, or the multi chip module which mainly carries IC and a chip-size package.
[0003] The circuit pattern by the conductor is formed in one side or both sides of a substrate which constitute a multilayer substrate. Between the circuit patterns between different substrates, it connects in the path called penetration through hole penetrated in the thickness direction of a multilayer substrate. When a circuit pattern is constituted by both sides of a substrate, it connects between the circuit patterns of substrate both sides in the path which penetrates one substrate called the blind beer hall and inner beer hall other than a penetration through hole. In order that a penetration through hole may penetrate all the layers of a multilayer substrate, the connection by this through hole occupied a predetermined area also in the unnecessary layer, and has checked the densification of wiring. moreover -- since a penetration through hole carries out the laminating of the multilayer substrate -- a hole -- the state where the laminating error of each substrate was integrated in order to carry out dawn and to form -- a hole -- dawn positioning will be carried out and this has also checked the densification of wiring the hole the aspect ratio expressed with the length/diameter of a penetration through hole after carrying out a laminating furthermore becomes large, and according to laser or chemical etching -- machining using [since dawn processing became difficult] the drill -- not depending -- a detailed hole which it does not obtain but is called the diameter of 0.2mm or less -- dawn is difficult
[0004] In order to make connection during the wiring on each substrate which constitutes a multilayer substrate, after covering a portion to make it connect with by the insulator layer, a different direction conductivity film is inserted and the method of carrying out heating sticking by pressure is proposed with open patent official report Showa No. 278196 [61 to], and common [No. 21960 / five to]. A different direction conductivity film makes resins, such as epoxy, distribute metal particles or the resin particle which carried out metallic coating.
[0005] The example which carries out the laminating of the double-sided wiring substrate in which the inner beer hall was formed, by such method is shown in drawing 2 . As for 12, the double-sided wiring substrate in which 15 formed the inner beer hall, and 13, an insulator layer and 14 are different direction conductivity films.
[0006] By this method, it became clear by examination of this invention persons that wiring density is

inadequate in connection resistance or connection reliability if the electrode size which wiring density becomes high, for example, you want to connect becomes the diameter of 500 micrometers or less comparatively, although sufficient connection resistance and connection reliability are acquired by the low case. That is, the electrode to make it connecting with is dented to the insulating layer, as it is produced simultaneously with the circuit portion with which it is not made to connect, and it is shown in drawing 2 , since it is the same height. If the conductive particle which two or more conductive particles distributed by a different direction conductivity film and different direction conductive resin need to stand in a row in the thickness direction of a different direction conductivity film or different direction conductive resin, and electrode area becomes small, and contributes to a flow decreases when it is stuck here by pressure on both sides of a different direction conductivity film or different direction conductive resin, in connection resistance or connection reliability, it will become a problem. A that the volume of that the conductive particle distributed by a different direction conductivity film and different direction conductive resin is smaller than thickness or the application thickness of a resin and a resin does not decrease greatly sake, Like the case where the electrode which wants to connect with an insulating layer also in the height with the same electrode is dented to the insulating layer Two or more conductive particles need to stand in a row in the thickness direction of a different direction conductivity film or different direction conductive resin, and if the conductive particle which electrode area becomes small and contributes to a flow decreases, in connection resistance or connection reliability, it will become a problem. When resistance becomes large, apparent signal delay becomes large, it becomes impossible to use it for a high speed signal processing circuit, and there is a problem to which the current value which can be passed because of the Joule's heat is restricted.

[0007]

[Problem(s) to be Solved by the Invention] The purpose of this invention is to offer the multilayer substrate which can be wired high-density. Furthermore, it is in offering the multilayer flexible substrate which can be wired high-density, with flexibility and the feature of a flexible substrate called an ultra-thin type having.

[0008]

[Means for Solving the Problem] The purpose of this invention is attained by the following composition.

[0009] ** It is the multilayer substrate which made two or more substrates by which the circuit pattern was formed at least in one side rival. A salient is formed at least in one side of the cladding side of two substrates made to rival. And the salient on another [with which this salient is compared at the time of cladding] substrate or the sum total of height with a pad It forms so that it may become larger than the sum total of the height of the conductor of the circuit pattern formed in the cladding side of the substrate of these two **********. In the multilayer substrate which made two or more substrates by which the circuit pattern was formed at least in multilayer substrate ** one side characterized by taking the flow during wiring of two substrates made to rival in this salient position rival It is the manufacture method of the multilayer substrate which formed the salient at least in one side of the cladding side of two substrates made to rival. A circuit pattern is formed on a substrate by the additive process which used the photoresist. The manufacture method of the multilayer substrate which newly carries out the laminating of the photoresist and is characterized by ****** which exfoliates the photoresist of two sheets simultaneously after salient formation, without exfoliating this photoresist used for circuit pattern formation in case a salient is succeedingly formed in a part of circuit pattern with plating.

[0010] Although rigid substrates, such as glass-epoxy used for the usual printed wired board, glass-bismaleimide triazine, and a glass-polyimide, can be used, since it is thin, the substrate of this invention has desirable adoption of an easy minute Kung-Ming injury comparison flexible substrate.

[0011] With this flexible substrate, an electric wiring pattern is formed in one side or both sides of plastic film, such as polyester film and a polyimide film, with conductive material, such as copper. As for the thickness of these plastic film, it is desirable to be chosen out of the range of 10 to 200 micrometers.

[0012] This conductive material is formed by plating, vacuum evaporationo, etc., and also it may make

metallic foils, such as copper foil, rival using adhesives. Generally, the thickness of wiring in plating or vacuum evaporationo is 0.2 micrometers to 10 micrometers, and is 9 micrometers to 70 micrometers in copper foil. The smaller one is suitable for detailed patterning, and, on the other hand, thickness excels [one / where thickness is larger] in dimensional stability or endurance. An electric wiring pattern can be formed by pattern etching, pattern plating, etc. using the resist. A flexible substrate can also be formed by adding a conductive material on plastic film, and also coating polyimide resin etc. on metallic foils, such as copper foil.

[0013] The salient of this invention has the method of forming using the wire bonder called the method of forming by the pattern plating using the resist, and stud bump. Or the method of making a part for a wiring portion and a height from a thick metallic foil by pattern etching of multiple times, and dividing from it, and the method of piling solder and the method of carrying out pattern printing of conductive resin are also possible. Although especially the quality of the material of a salient is not limited, in order to make resistance small, adoption of gold, silver, and copper is desirable, and adoption of gold, nickel, and solder is desirable at a point with good corrosion resistance. Moreover, it is desirable composition to also make gold and nickel cover thinly, after that copper projects.

[0014] A multilayer substrate means what carried out the two or more sheet laminating of this substrate. In the point of taking the electrical connection during the wiring on a different substrate, it is important to take the electrical connection during the wiring on two substrates which form a salient at least in one side of the cladding side of two substrates which a through hole is not adopted [one side] but makes it rival like before, and are made to rival via this salient because of high-density wiring. Equivalent [to the side which forms a salient in both cladding sides of two substrates or forms a salient in one of the two, and counters him / to the height of the conductor of a circuit pattern], the pad of the height not more than it is formed in it, and electrical connection is taken through a different direction conductivity film, different direction conductive resin, and conductive resin between salients or a salient, and a pad.

[0015] connecting between the wiring formed in both sides of a substrate -- one substrate -- a hole -- breaking -- a hole -- inside is realizable by flow-izing with plating etc.

[0016] A different direction conductivity film means what the mixed resin of thermosetting resin or thermosetting resin, and thermoplastics, such as epoxy, was made to distribute what covered further 20-micrometer metal particles, resin clothing metal particles, and the metallic-coating resin particle metallurgy group covering resin particle with the resin from the diameter of 3 micrometers, and was made into the dry shape of a 50-micrometer film from 10 micrometers in thickness. A flow can be aimed at only in the thickness direction by the conductive particle which a resin is stiffened in the thickness direction by carrying out heating sticking by pressure, and pasted up two substrates and was distributed by moderate density. The paste-like thing which made the resin containing the solvent distribute the same conductive particle is called different direction conductive resin. Since a conductive particle is contained by high density rather than different direction conductive resin, conductive resin does not have the anisotropy of a flow. Since it does not have an anisotropy in the flow direction, when taking the electrical connection during the wiring on two substrates, as for conductive resin, it is desirable to apply a resin only to a portion to make it connect with. When carrying out the laminating of the insulating layer to a circuit pattern, it is not necessary to apply a resin only to a portion to make it not necessarily connect with. Adoption of different direction conductive resin is desirable at the point of being easy to respond to the connection pattern of a ** pitch.

[0017] In this invention, it is important to form so that the salient on another [which is compared at the time of cladding] substrate or the sum total of height with a pad may become larger than the sum total of the height of the conductor of the circuit pattern formed in the cladding side of the substrate of these two **********. It is desirable to form so that the salient on another [which is compared at the time of cladding] substrate or the sum total of height with a pad may become large in 5 to 50 micrometers rather than the sum total of the height of the conductor of the circuit pattern formed in the cladding side of the substrate of these two **********. 35 micrometers is 10 micrometers to 25 micrometers still more preferably from 8 micrometers more preferably. When the salient on another [which is compared at the time of cladding] substrate or the sum total of height with a pad is higher than the sum total of the

height of the conductor of the circuit pattern formed in the cladding side of the substrate of these two ********** at less than 5 micrometers, in an electrical installation position, condensation of the conductive particle in a different direction conductivity film or different direction conductive resin does not take place enough, but can acquire neither good low resistance nor high reliability easily. The salient on another [which is compared at the time of cladding] substrate or the sum total of height with a pad Rather than the sum total of the height of the conductor of the circuit pattern formed in the cladding side of the substrate of these two **********, when larger than 50 micrometers The distance between the substrates made to rival needs to separate and it is necessary to thicken the resin containing the different direction conductivity film filled up with between substrates, or different direction conductive resin, i.e., a conductive particle. The adhesive strength between substrates does not become small, condensation of the conductive particle in the nose of cam of a salient does not take place enough in the process which compresses a thick different direction conductivity film and different direction conductive resin by part for a height, it is hard to acquire good low resistance and high reliability, and also this problem has cost in high salient formation. the case where an insulating layer is formed at least in one side of a cladding side -- the conductor of a circuit pattern -- height -- replacing with -- the conductor of a circuit pattern -- the height of the insulating layer which covers this in height -- in addition, it can think the same way

[0018] The insulating layer of this invention consists of resins, such as a polyimide, a polyamide, an acrylic, and epoxy. The salient or pad portion with which this insulating layer is compared in one [at least] field of the lamination side of two substrates made to rival is removed and formed. There are a method of carrying out pattern etching of the insulating layer applied all over print processes, such as screen-stencil, using a resist as a method of forming an insulating layer except for the salient or pad portion compared and the method of carrying out pattern etching using a photosensitive insulating material.

[0019] Although an example of the manufacture method of the multilayer substrate of this invention is explained using drawing 1 , it is not limited to this.

[0020] The polyimide film 1 of predetermined thickness is prepared and the hole 2 of a predetermined diameter is broken in a predetermined position by (a) and laser (b). a hole -- (c) which forms the copper film 3 with a thickness of 0.2 micrometers in the film which carried out dawn by the electroless-plating method A copper film is formed also in the interior of a hole with electroless plating. The dry film photoresist 4 is stuck on these film both sides, negatives are exposed and developed and patterning of the dry film photoresist 4 is carried out to (d) and the configuration corresponding to wiring, the salient, and the pad (e). Subsequently, the copper film 5 with a thickness of 10 micrometers is formed by the electrolysis galvanizing method (f). A copper film deposits only into the portion which the copper film which the dry film photoresist was removed and was formed with electroless plating exposed. Furthermore the dry film photoresist 6 is stuck on both sides, negatives are exposed and developed and patterning of the dry film photoresist is carried out to (g) and the configuration corresponding to the salient (h). The laminating of the film 7 with a thickness of 15 micrometers is again carried out by the electrolysis galvanizing method, and a salient higher 15 micrometers than (i) and wiring section thickness is formed. The dry film photoresists 4 and 6 are exfoliated (j), (k which carries out flash plate etching and subsequently removes the electroless-plating film 3).

[0021] Drawing 1 (a) A dry film photoresist is removed after the process of - (f), subsequently flash plate etching removal of the electroless-plating film is carried out, and the flexible substrate of (l) is obtained. After washing a substrate and drying, the protection film 8 is stuck on one field, and the insulator layer pattern 9 with a thickness of 5 micrometers from which the photosensitive polyimide was applied to another field, and it dried, exposed, negatives were developed, it heat-treated, and the pad portion was removed is formed (m). Subsequently, the copper film 10 with a thickness of 6 micrometers is formed by the electroless-plating method (n). A copper film deposits only into the portion which the copper film which the insulator layer was removed and was formed with electroless plating exposed. The protection film 8 is exfoliated (o).

[0022] Two flexible substrates shown in drawing 1 (k) and (o) in this way are obtained. The different direction conductivity film 11 is put on one flexible substrate, temporary sticking by pressure is carried

out with a 80-degree C bonding tool, and, subsequently the protection film of a different direction conductivity film is exfoliated. Alignment of the salient and pad with which two flexible substrates correspond is carried out, actual sticking by pressure is carried out with a 290-degree C bonding tool, and a multilayer flexible substrate with wiring of four layers is obtained.
[0023] Although the dry film photoresist was exfoliated at once after drawing 1 (f) and the dry film photoresist was stuck anew conventionally, since the intermediate exfoliation process was skipped, by this invention, the following dry film photoresist can be stuck in the state with few level differences. If a level difference is large, an opening will occur between a resist and a substrate in the portion of a level difference, and it is easy to start the problem which peeling of a resist and plating liquid sink in and comes out of and which a plating film generates into an excessive portion.
[0024] moreover, an ablation process -- if spread, a washing process can be skipped and a cost cut can be aimed at
[0025] In an above-mentioned example, although the dry film photoresist was used, a liquefied photoresist and an electrodeposted resist can be used similarly.
[0026] The multilayer substrate concerning this invention is used for the multi chip module adapting a high-density electronic-circuitry patchboard or it, a single chip module, a chip-size package, a ball grid array package, etc.
[0027]
[Example]
The multilayer substrate was produced at the process shown in example 1 drawing 1 . On the polyimide film 1 ("Kapton "E and E. I. du Pont de Nemours& Co., Toray Industries) with a thickness of 25 micrometers, the hole 2 with a diameter of 20 micrometers was broken in the focal method in the predetermined position using the 4th higher-harmonic laser of YAG. a hole -- this film that carried out dawn was washed and the copper film 3 with a thickness of 0.2 micrometers was formed by the electroless-plating method It stuck on these film both sides, and the dry film photoresist 4 ("die YARON" FRA-075 and Mitsubishi Rayon Co., Ltd.) with a thickness of 10 micrometers was photo-mask-exposed, was developed, and patterning of the dry film photoresist was carried out to the configuration corresponding to wiring, the salient, and the pad. Subsequently, the copper film 5 with a thickness of 10 micrometers was formed by the electrolysis galvanizing method. Furthermore, it stuck on both sides, and the dry film photoresist 6 ("die YARON" FRA-075 and Mitsubishi Rayon Co., Ltd.) with a thickness of 15 micrometers was photo-mask-exposed, was developed, and patterning of the dry film photoresist was carried out to the configuration corresponding to the salient. The laminating of the copper film 7 with a thickness of 15 micrometers was again carried out by the electrolysis galvanizing method, and the salient higher 15 micrometers than wiring section thickness was formed. The diameter of a salient was set to 100 micrometers. The dry film photoresists 4 and 6 were exfoliated, subsequently, flash plate etching was carried out and the electroless-plating film 3 was removed. The flexible substrate of drawing 1 (k) was obtained in this way.
[0028] Drawing 1 (a) The dry film photoresist was removed after the process of - (f), subsequently flash plate etching removal of the electroless-plating film was carried out, and the flexible substrate of (l) was obtained. After washing the substrate and drying, the protection film 8 with a thickness of 25 micrometers was stuck on one field, the photosensitive polyimide 9 ("photograph NISU" UR [3100] and Toray Industries, Inc.) was applied to another field, and dryness and the insulator layer pattern with a thickness of 5 micrometers from which it photo-mask-exposed, negatives were developed, it heat-treated, and the pad portion was removed were formed. Subsequently, the copper film 10 with a thickness of 6 micrometers was formed by the electroless-plating method. The protection film 8 was exfoliated. The flexible substrate of drawing 1 (o) was obtained in this way.
[0029] The different with a thickness of 16 micrometers direction conductivity film 11 ("ANISORUMU" AC-7201 and Hitachi Chemical Co., Ltd.) was put on the flexible substrate of drawing 1 (o), temporary sticking by pressure was carried out for 10 seconds with the 80-degree C bonding tool from the different direction conductivity film side, and, subsequently to an opposite side, temporary sticking by pressure with a flexible substrate exfoliated the protection film of the existing

different direction conductivity film. Alignment of the salient and pad with which two flexible substrates correspond was carried out, from the substrate side of drawing 1 (o), it is 280-degree C BONDEDINGUTSURU, actual sticking by pressure was carried out for 60 seconds, and the multilayer flexible substrate with wiring of four layers was obtained.

[0030] When resistance of the connection between substrates of the multilayer flexible substrate obtained in this way was measured, resistance of connection (salient) hit 7mohm to 15mohm was measured, and it was good.

[0031] The multilayer flexible substrate which has the wiring layer of four layers like an example 1 was obtained except not performing the plating upper load 10 of a up to [the pad of not forming example 2 insulator layer 9 and drawing 1 (n)].

[0032] Although resistance of connection (salient) hit 9mohm to 13mohm was measured and it was good when resistance of the connection between substrates of the multilayer flexible substrate obtained in this way was measured, leak of current might be observed between the circuit patterns which adjoin the connection between substrates, and this by deformation of the position gap at the time of substrate cladding and a substrate.

[0033] It is the conductive particle (Sekisui Fine chemicals) which plated example 3 thermal-resistance epoxy system adhesives with gold at the polystyrene particle with a diameter of 5 micrometers 1x108 An individual / cm3 It was made to distribute by density and different direction conductive resin was obtained. Instead of the different direction conductivity film, the spin coat of this different direction conductive resin was carried out so that it might become the flexible substrate of drawing 1 (o) at 15 micrometers in thickness, Alignment of the salient and pad with which the flexible substrate to which this different direction conductive resin was applied, and the flexible substrate of drawing 1 (k) correspond is carried out. The multilayer flexible substrate with wiring of four layers was obtained from the substrate side of drawing 1 (o) like the example 1 except the 280-degree C thing stuck by pressure for BONDEDINGUTSURU 60 seconds.

[0034] When resistance of the connection between substrates of the multilayer flexible substrate obtained in this way was measured, resistance of connection (salient) hit 13mohm to 24mohm was measured, and it was good.

[0035] The multilayer flexible substrate which has wiring of four layers like an example 1 was obtained except having made copper plating in example 4 drawing 1 (i) into 3 micrometers in thickness. Although the resistance of connection (salient) hit 80mohm to 200mohm was measured and resistance was large compared with the example 1 when resistance of the connection between substrates of the multilayer flexible substrate obtained in this way was measured, compared with the example 1 of comparison, resistance was small.

[0036] The multilayer flexible substrate which has wiring of four layers like an example 3 was obtained except having set thickness of having made copper plating in example 5 drawing 1 (i) into 100 micrometers in thickness, and different direction conductive resin to 80 micrometers. Although the resistance of connection (salient) hit 40mohm to 100mohm was measured and resistance was large compared with the example 1 when resistance of the connection between substrates of the multilayer flexible substrate obtained in this way was measured, compared with the example 1 of comparison, resistance was small.

[0037] Example of comparison 1 drawing 1 (a) The dry film photoresist was removed after the process of - (f), subsequently flash plate etching removal of the electroless-plating film was carried out, and the flexible substrate of 12 of drawing 2 was obtained. Like drawing 2 , after washing the substrate and drying, the photosensitive polyimide 13 ("photograph NISU" UR [3100] and Toray Industries, Inc.) was applied to the cladding side side, and dryness and the insulator layer pattern with a thickness of 5 micrometers from which it photo-mask-exposed, negatives were developed, it heat-treated, and the pad portion was removed were formed.

[0038] The different with a thickness of 16 micrometers direction conductivity film 14 ("ANISORUMU" AC-7201 and Hitachi Chemical Co., Ltd.) was put on this flexible substrate, from the different direction conductivity film side, it is 80-degree C BONDEDINGUTSURU, temporary sticking

by pressure was carried out for 10 seconds, and, subsequently to an opposite side, temporary sticking by pressure with a flexible substrate exfoliated the protection film of the existing different direction conductivity film.
[0039] Drawing 1 (a) The dry film photoresist was removed after the process of - (f), and the flexible substrate from which flash plate etching removal of the electroless-plating film is subsequently carried out, and the circuit pattern of 15 of drawing 2 differs was obtained.
[0040] Alignment of the salient and pad with which two flexible substrates correspond was carried out, from the substrate side of 15 of drawing 2 , it is 280-degree C BONDEDINGUTSURU, actual sticking by pressure was carried out for 60 seconds, and the multilayer flexible substrate with wiring of four layers was obtained.
[0041] When resistance of the connection between substrates of the multilayer flexible substrate obtained in this way was measured, dispersion in connection (salient) hit 300mohm to 1kohm was large, strong resistance was measured and the value was also poor.
[0042]
[Effect of the Invention] this invention is the multilayer substrate which made two or more substrates in which the circuit pattern was formed rival. The salient for the electrical installation of two substrates is formed at least in one side of the cladding side of two substrates made to rival. And since it is formed and this salient becomes as the salient on another [which is compared at the time of cladding] substrate or the sum total of height with a pad becomes larger than the sum total of the height of the conductor of the circuit pattern formed in the cladding side of the substrate of these two ********** By low resistance, it is stabilized and electrical installation during wiring of two substrates made to rival can be realized. Moreover, since a through hole is not used for connection between substrates, high-density wiring is attained.

[Translation done.]

* NOTICES *

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PRIOR ART

[Description of the Prior Art] The multilayer substrate is contributing to small lightweight-ization of electronic equipment as a high-density-assembly substrate of electronic parts. Especially, a flexible multilayer substrate is characterized by flexibility and the ultra-thin type, and is used for the circuit board which carries electronic parts, such as IC and resistance, or the multi chip module which mainly carries IC and a chip-size package.
[0003] The circuit pattern by the conductor is formed in one side or both sides of a substrate which constitute a multilayer substrate. Between the circuit patterns between different substrates, it connects in the path called penetration through hole penetrated in the thickness direction of a multilayer substrate. When a circuit pattern is constituted by both sides of a substrate, it connects between the circuit patterns of substrate both sides in the path which penetrates one substrate called the blind beer hall and inner beer hall other than a penetration through hole. In order that a penetration through hole may penetrate all the layers of a multilayer substrate, the connection by this through hole occupied a predetermined area also in the unnecessary layer, and has checked the densification of wiring. moreover -- since a penetration through hole carries out the laminating of the multilayer substrate -- a hole -- the state where the laminating error of each substrate was integrated in order to carry out dawn and to form -- a hole -- dawn positioning will be carried out and this has also checked the densification of wiring the hole the aspect ratio expressed with the length/diameter of a penetration through hole after carrying out a laminating furthermore becomes large, and according to laser or chemical etching -- machining using [since dawn processing became difficult] the drill -- not depending -- a detailed hole which it does not obtain but is called the diameter of 0.2mm or less -- dawn is difficult
[0004] In order to make connection during the wiring on each substrate which constitutes a multilayer substrate, after covering a portion to make it connect with by the insulator layer, a different direction conductivity film is inserted and the method of carrying out heating sticking by pressure is proposed with open patent official report Showa No. 278196 [61 to], and common [No. 21960 / five to]. A different direction conductivity film makes resins, such as epoxy, distribute metal particles or the resin particle which carried out metallic coating.
[0005] The example which carries out the laminating of the double-sided wiring substrate in which the inner beer hall was formed, by such method is shown in drawing 2 . As for 12, the double-sided wiring substrate in which 15 formed the inner beer hall, and 13, an insulator layer and 14 are different direction conductivity films.
[0006] By this method, it became clear by examination of this invention persons that wiring density is inadequate in connection resistance or connection reliability if the electrode size which wiring density becomes high, for example, you want to connect becomes the diameter of 500 micrometers or less comparatively, although sufficient connection resistance and connection reliability are acquired by the low case. That is, the electrode to make it connecting with is dented to the insulating layer, as it is produced simultaneously with the circuit portion with which it is not made to connect, and it is shown in drawing 2 , since it is the same height. If the conductive particle which two or more conductive particles distributed by a different direction conductivity film and different direction conductive resin need to

stand in a row in the thickness direction of a different direction conductivity film or different direction conductive resin, and electrode area becomes small, and contributes to a flow decreases when it is stuck here by pressure on both sides of a different direction conductivity film or different direction conductive resin, in connection resistance or connection reliability, it will become a problem. A that the volume of that the conductive particle distributed by a different direction conductivity film and different direction conductive resin is smaller than thickness or the application thickness of a resin and a resin does not decrease greatly sake, Like the case where the electrode which wants to connect with an insulating layer also in the height with the same electrode is dented to the insulating layer Two or more conductive particles need to stand in a row in the thickness direction of a different direction conductivity film or different direction conductive resin, and if the conductive particle which electrode area becomes small and contributes to a flow decreases, in connection resistance or connection reliability, it will become a problem. When resistance becomes large, apparent signal delay becomes large, it becomes impossible to use it for a high speed signal processing circuit, and there is a problem to which the current value which can be passed because of the Joule's heat is restricted.

[Translation done.]

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DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]
[Drawing 1] The cross section showing the process and structure of a multilayer substrate of this invention. [of an example]
[Drawing 2] The cross section showing the structure of the conventional multilayer substrate.
[Description of Notations]
1: Plastic film
3: Electroless-plating film
4 6: Photoresist
5 7: Electrolysis plating film
8: Protection film
9 13: Insulating layer
11 14: Different direction conductivity film

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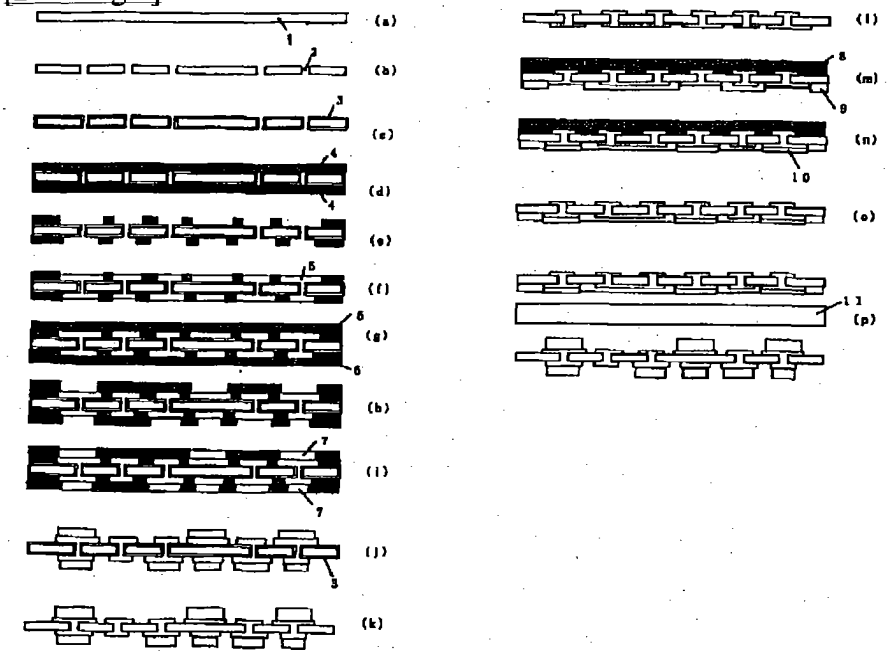
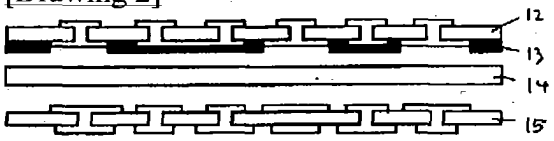
DRAWINGS

[Drawing 1]



[Drawing 2]



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